Knowledge   Risk

Balancing Risk with Knowledge

Quotes from CAIB Report

Knowledge Management at Goddard

Safety Council, May 3, 2004

Knowledge, Risk and Safety

1. The more you know, the more you realize how much you don't know.

2. The more you realize how much you don't know the more risk you see.

3. The more risk you see, the more concerned you are about safety.

4. The more concerned you about safety, the more you want to know. (see # 1)

The High Expectations of NASA

- **NASA Must Achieve Grandly**
  - Science and Exploration Goals
  - Engineering and Technology Means
  - Enriching Lives with Meaning
- **NASA Must Perform Excellently**
  - Mission Safety
  - Mission Success
  - Project Management Cost and Schedule
- **NASA Must Lead Distinctively**
  - Attract and Motivate the Best in People
  - Organize and Function Efficiently
  - Learn Continuously

All of this requires the consistent ability to reapply knowledge acquired into new projects and processes.

Does Not Look Like a Learning Organization

"The Board concludes that NASA's current organization does not provide effective checks and balances, does not have an independent safety program, and <u>has not demonstrated the characteristics of a learning organization</u>."

CAIB Report (2003) Synopsis, Page 12

Not Functioning as a Learning Organization

"Shuttle management declined to have the crew inspect the Orbiter for damage, declined to request on-orbit imaging, and ultimately discounted the possibility of a burn-through."

"The Board views the failure to do so as an illustration of the lack of institutional memory in the Space Shuttle Program that supports the Board's claim… that <u>NASA is not functioning as a learning organization</u>."

CAIB Report (2003) Section 6.1, Page 127

No Confidence of Being Able to Change Itself

"Based on NASA's history of ignoring external recommendations, or making improvements that atrophy with time, the Board has <u>no confidence that the Space Shuttle can be safely operated for more than a few years</u> based solely on renewed post-accident vigilance."

CAIB Report (2003) Synopsis, Page 13

Unaccounted for Program Risk

"It is the Board's view that, in retrospect, the increased complexity of a Shuttle designed to be all things to all people <u>created inherently greater risks</u> than if more realistic technological goals had been set at the start."

CAIB Report (2003) Section 1.2, Page 23

Program Managers are Gambling

"When a program agrees to spend less money or accelerate a schedule beyond what the engineers and program managers think is reasonable, a small amount of overall risk is added. These little pieces of risk add up until <u>managers are no longer aware of the total program risk, and are, in fact, gambling</u>."

CAIB Report (2003) Section 6.2, Page 139

Proving 'Unsafety'

"In the face of Mission managers' low level of concern and desire to get on with the mission, Debris Assessment Team members had to prove unequivocally that a safety-of-flight issue existed before Shuttle Program management would move to obtain images of the left wing. <u>The engineers found themselves in the unusual position of having to prove that the situation was unsafe</u>- a reversal of the usual requirement to prove that a situation *is safe*."

Shifting Responsibility Outside

"NASA structure changed as roles and responsibilities were transferred to contractors, which <u>increased the dependence on the private sector for safety</u> functions and risk assessment while simultaneously reducing the in-house capability to spot safety issues."

CAIB Report (2003) Section 8.5, Page 202

Ineffective Safety System

"NASA's safety system lacked the resources, independence, personnel, and authority to successfully apply alternate perspectives to developing problems. Overlapping roles and responsibilities across multiple safety offices also undermined the possibility of a reliable system of checks and balances."

CAIB Report (2003) Section 8.5, Page 202

Rules that Preclude Listening

"NASA's culture of bureaucratic accountability emphasized chain of command, procedure, following the rules, and going by the book. While rules and procedures were essential for coordination, they had an unintended but negative effect. Allegiance to hierarchy and procedure had <u>replaced deference to NASA engineers' technical expertise</u>."

CAIB Report (2003) Section 8.5, Page 200

Hearing Only Expected Answers

"The organizational structure and hierarchy blocked effective communication of technical problems. Signals were overlooked, <u>people were silenced</u>, and useful information and <u>dissenting views on technical issues did not surface at higher levels</u>. What was communicated to parts of the organization was that O-ring erosion and foam debris were not problems."

Afraid to Speak Up

"They are afraid of becoming rendered ineffective and being moved to a different job, which to somebody at NASA…is the equivalent of being fired."

Jim Weatherby, Astronaut

"Open communication is not yet the norm, and <u>people do not feel fully comfortable raising safety concerns to management</u>."

BST Culture Report to NASA

So What is the KM Problem?

- Project Management Processes are not <u>reliable</u> in the application of Knowledge.

  1. Team make up determines team outcome as much as team function or structure)

  2. Organizational communication processes introduce unaccounted risk to the system

  3. Knowledge loops are longer than operational throughput cycle time

So What is the KM Problem?

- Project Management Systems as they are deployed are not <u>sustainable</u> for the future.
    1. Social networks are decaying faster than they are being reproduced
    2. Knowledge sharing legacy systems are not built around today's digital workplace structures
    3. Mentors have a time-space gap with Mentees for effectively sharing knowledge

Goddard Implementation Plan

We cannot assume that the skills and experiences developed across five decades of space exploration are genetically inherited…

While each new generation of scientists and engineers builds on the successes of previous generations, there is a period of learning and overlap, much like the transition in a relay race, where one generation runs along beside the other until the handoff is made.

Goddard Implementation Plan FY2004 Page 5

KM Office at Goddard

- GOAL: Make knowledge handoff happen
  - Collecting our lessons, sharing them with each other and facilitating open sharing dialogue.
  - Creating events, tools and space for the wisdom we have learned to be transferred to others.
  - Crafting policies and standards to ensure timely, accurate access to Goddard knowledge.

The Pillars of KM at Goddard

Building the Learning Organization

Managing Knowledge Assets

Facilitating Reapplication of Knowledge

Goddard Learning Initiatives

- Goddard Library (Collecting Knowledge Assets)
  - Videos, Images, Web Pages and Project Docs (Digital Indexing)
  - MyLibrary & Ask a Librarian (Desktop Tools)
  - Open Archives Initiative (Document Preservation)
- Goddard Knowledge Exchange (Sharing Knowledge)
  - Goddard Lessons Learned (Collection of Raw LL from Goddard)
  - Case Stories (Written summaries of project experiences)
  - Knowledge Sharing Workshops (Oral dialogue)
- Goddard Learning Organization (Policies and Standards)
  - Goddard Core Metadata Standards (Project documentation)
  - After Action Observations (Patterned after the DoD AAR)
  - Goddard Open Learning Design (Rules, Procedures & Standards)